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(54) Abstract Title
Calibrating a digital printing press

(57)   In a method for calibrating by means of colour management a digital printing press having a permanent printing forme, image data are prepared for the printing process in a pre-press stage in machine-independent format 2 by means of a data-processing device 3 and supplied in adapted form to the printing press 1. The data-processing device for the final data preparation for printing automatically uses a profile corresponding exactly to the current state of the machine; thus the data processor can be addressed with the correct colour space conversion for the printing machine, i.e. can be calibrated. In order to do this, at the instant of the data preparation 3 for the production of images 4, a machine state predicted for the instant of printing is extracted, as at 8, and from this, together with knowledge about the working materials 7, is determined the machine profile 6 that comes closest to the profile for the print job. This profile 5 is then used for the data preparation. The chosen profile can be interpolated (15, Fig 2) if necessary. Any remaining deviations can be corrected (31, Fig 3) in a second step (30) using one dimensional colour correction tables. Communication between data preparation 3 can take place via a job ticket (50, Fig 4) containing profiles of the machine, ink and external parameters. A profile data pool (60, Fig 5) can be provided to decide between which of a plurality of printing machines a job should be given to, the communication can be remote e.g. via the internet.
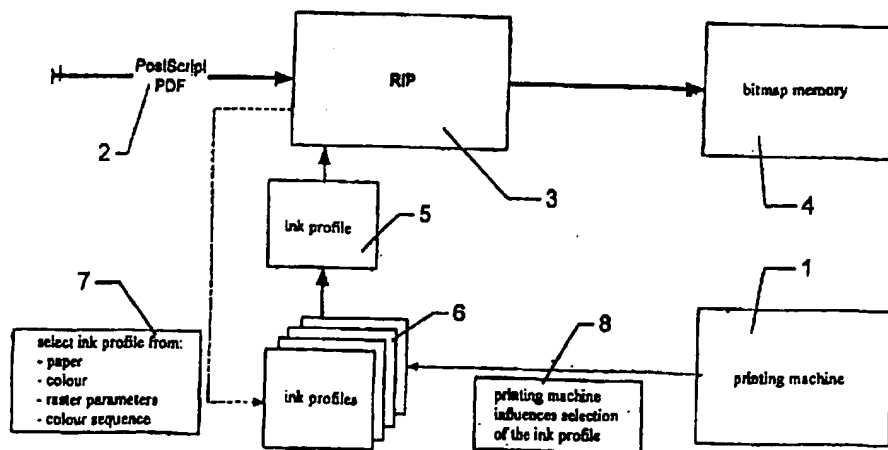
Fig. 1

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Calibrating a digital printing machine

The invention relates to a method for calibrating the image data to the state of a digitally controllable printing machine having a permanent printing forme.

Such a printing machine, as known from DE 295 16 830 U1, for example, works in particular according to one of the processes of lithographic offset, gravure printing or flexo printing, i.e. a printing forme is generated once with a subject to be printed, in order to generate a plurality of copies of this subject from this printing forme. In this connection, the printing forme can be fully erasable and reusable, i.e., after cleaning, a further subject can be applied thereto.

A basic feature of a digitally controllable printing machine, however, is that the image data to be loaded into the machine are present completely in digital form and that these data are used in a specific manner on the printing machine in order to produce images on the printing forme.

The production of images preferably takes place inside the printing machine, but is also fully conceivable in any combination of printing-forme exposure unit and printing forme linked by means of information technology.

In order to characterise the printing system in terms of colour, a so-called profiling of a printing system is now carried out by generating a test pattern from a known machine-independent data record and printing it. This test pattern usually contains fields whose construction from the individual printing inks of the output device is predetermined. Thus, for example, the IT8.7/3 colour test chart is used for CMYK devices. Each of the measurement fields has a defined

composition made up of the individual colours cyan (C), magenta (M), yellow (Y) and black (K).

After the output of this colour test chart, the colour locations of the measurement fields in the colour space are measured. From these measured values and the known composition of the measurement fields, the output characteristic of the printing system can be determined and a special device profile created. This profile indicates which colour space the printer covers and how the individual colour locations in the achievable colour space can be achieved. The system of coordinates used for this purpose is usually a device-independent colour system, for example the XYZ colour system, the Lab colour system or its development the Lab(94) colour system.

In the data processing before printing, in general called the pre-press stage, this device profile is then used to transform from the working colour space, usually an RGB colour space for scanners and monitors, into the printer colour space. In this connection, the profile of the working colour space is linked with that of the printer.

The conversion from one colour space into the other is not without problems, because the colour spaces, in particular in the case of RGB to CMYK conversions, do not coincide in some regions. For this reason, additional factors can be included during the conversion to specify the type of conversion in greater detail.

In all, this manner of proceeding is generally known in the literature as colour management (see EP 0 676 285 B1, for example).

The basic idea of colour management is that colour originals are fixed in the digital pre-press stage irrespective of the output device and the materials used. If the output of images defined in this way

takes place by way of a system calibrated in the sense of the colour management, it is ensured that the colour appearance of the output is theoretically always the same or optimal, completely irrespectively of the

5   output process used.

To refer to the most well-known standard, this is the standard of the ICC (International Color Consortium) with the ICC device profiles defined there. The device profile is, under the specified lighting and

10   measuring conditions, always well-defined. The manner of the conversion into the device profile, however, can take place in different ways. In the case of ICC profiles, for example, there are four different target policies. The conversion can be absolutely

15   colorimetric, relatively colorimetric, saturated or photographic. Absolute colorimetry, for example, means that the colour locations are to be transformed absolutely correctly. In this way, all colour values which occur in both colour spaces are theoretically

20   identical. Those which cannot be represented in the CMYK colour space have to be transformed according to an additional specification, e.g. by placing them on the colour space border.

An important special case in colour space

25   conversion is the CMYK to CMYK transformation, which converts from one printer colour space into another. This is necessary in particular for proofing purposes (the English term proofing is to be understood to mean general colour checking methods) or in a pre-separated

30   procedure, i.e. if CMYK data which do not correspond to the current profile arrive at the printer.

The problem which presents itself in a complex output device, such as a printing machine, is that the profiles differ according to the printing material

35   used, the ink used, the raster type and raster definition used, and the achromatic construction used.

Moreover, the machine characteristic itself naturally enters into the profile.

The parameters which do not depend on the printing machine but instead on the printing material, the ink and the type of data preparation (raster) will hereafter be called external parameters.

Even if the machine status can be assumed to be constant, the combination of external parameters results in a plurality of different profiles. This plurality of profiles has to be held in a database, for example, in order then to be selected at the instant of the conversion. According to the prior art, this selection is made manually or by calling up a profile according to its name or its number.

Furthermore, the selected profiles do not correspond exactly to the current machine state but instead to the state of the printing machine when the profiling was carried out. It is possible that, on the basis of different machine states, in the case of the same combination of external parameters, different profiles have to be used.

Strictly speaking, therefore, the printing machine always has to be put into the state in which it was at the instant of profiling. Because of variable ambient conditions, such as temperature and air humidity, or changing machine components, such as hardness of the rubber blanket, roller printing widths, the machine state changes and deviates from the target.

Until now, this problem has been solved by selecting and applying a profile manually or semi-manually, but in particular not machine-specifically.

In this connection, the presence on the printing machine of final control elements (ink zone screws, ink duct roller speed adjustment) influencing the machine state is used. In this way, the machine state can be adapted to a limited extent to the target, i.e. to the

state displayed at the instant of profiling. This, however, is expensive, because it costs machine time and produces copies which cannot be sold, and on the other hand there are printing systems, for example the offset printing machines which print in the anilox process, which no longer have such final control elements, or no longer have a sufficient number of them.

Although this problem exists in all printing devices, it occurs more strongly in printing machines having a permanent printing forme, on the one hand because these printing machines work in a highly productive way and thus incur significant machine-shutdown costs if it is necessary to re-profile, and on the other hand because a re-adjustment which can no longer be dealt with by means of the machine final control elements requires the creation of a new printing forme, which likewise costs time and material.

An object of the invention is to develop a method with the aid of which the data-processing device for the final data preparation for the printing, usually the RIP (Raster Image Processor), automatically uses a profile corresponding exactly to the current state of the machine so that it can be addressed with the correct colour space conversion for the printing machine, i.e. can be calibrated.

This object is achieved by the method steps in accordance with claim 1.

The idea of the invention can be used irrespective of printing method. The invention can be realised for wet or dry offset printing, direct or indirect gravure printing, flexo printing, etc.

The calibration of a digitally controllable printing machine having a permanent printing forme is accordingly carried out in such a way that at the instant of the data preparation for the image

production, a machine state predicted for the instant of printing is extracted; from this, together with the knowledge about the working materials, is determined the corresponding printing-machine profile which comes closest to the print job; and this profile is used for the data preparation.

Preferably, in a profile data pool there are stored in addition to the ink profile generic data of the printing machine or the working materials, which data allow a direct information-technological conclusion about the machine state at the instant of profiling and a correction to the current state. In this way, it is possible for a machine profile to contain all relevant data in order to permit the adaptation to the state of an individually addressable printing machine and to restrict the number of necessary profiles to the necessary amount.

For a better understanding of the invention embodiments of it will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a block-circuit diagram which generally illustrates the sequence of the data flow in an embodiment of the invention;

Figure 2 shows a block-circuit diagram of a further embodiment which shows a variant of the sequence in accordance with Figure 1;

Figure 3 shows a block-circuit diagram of a third embodiment which shows a further variant of the sequence in accordance with Figure 1;

Figure 4 shows a block-circuit diagram of a fourth embodiment which shows a further possible sequence of the data flow with job tickets; and

Figure 5 shows a diagrammatic picture of a profile data pool.

As already described in the introduction, a

digitally controllable printing machine 1 in accordance with Figure 1 uses digital image data which represent the images to be printed and which have been created outside the printing machine in the pre-press stage 70 (Figure 4) in a machine-independent format, such as in PostScript format 2, for example. This image information is supplied to a data-processing device, generally an RIP 3, which is assigned to the printing machine 1 and which prepares the image data for the printing process by generating for each colour to be printed a digital pixel pattern which is adapted to the printing machine 1. Each pixel pattern can be supplied by means of a bitmap memory 4 to the imaging unit of the printing machine, which then generates a visible printed image pixel-by-pixel on a substrate.

A number of ink profiles 5 are available from a profile pool 6. These profiles 5 have either already been produced by the manufacturer and delivered with the machine, or been created by the client by way of a predetermined profiling procedure.

In order to determine the machine profile, a test form is printed with the desired combination of external parameters 7, the test form is measured, and with one of the known colour management algorithms which are also commercially available from the companies Agfa or Logo, for example, an ink profile 5 is created.

Additionally, current machine parameters are ascertained from the measurement fields (colour test chart, for example IT8.7/3). These are at least the printing characteristics 10 (Fig.3) of the individual colours, which are ascertained by measuring different area coverages of the individual colours. Printing characteristics 10 can be stored as density characteristics or as tone value increment curves together with the full-tone density. Furthermore, they

can be ink acceptance factors, which are obtained by way of the usual measurement methods in the case of superimposed printing of two or more colours. If the measurements are carried out spectrally, i.e. one spectrum recorded per measuring point, then both colorimetric variables, such as colour locations, and process-control variables, such as ink densities, can be derived with the same data.

In a variant, in order to render possible a comparison with the densitometric measurements usual for this purpose and in particular also to be able to work with measurements carried out online in the printing machine, at least the relevant measurement fields for the process-control characteristic quantities can also additionally be measured with series-connected polarising filters. This can take place spectrally, in which case at least the densitometric variables are derived, and can also take place directly using densitometric measuring heads.

Furthermore, the individual spectra of the colours can also be stored in the profile, in order to allow densitometric, colorimetric or spectral regulation.

The ink profile which has been calculated is then stored in a suitable medium 6 with the process-control machine parameters 10 that have been ascertained. The profile also contains the relevant external parameters 7, such as paper, ink, raster type and possibly further process-describing and machine-describing parameters, such as colour sequence, humidity, temperature, and in offset printing the roller printing widths, i.e. roller in-feeds, type of rubber blanket used.

Ideally, all profiles are recorded with the same machine state. If this is not the case, they are converted to a desired machine state in order to be comparable to each other. This can, for example, take place by means of an expert system, as described in the

prior German application P 198 22 662.4-27. The conversion preferably takes place by way of adaptation of the tone value increase, i.e. the printing characteristic in the ink profile.

5   In an advantageous development, in order to improve the comparability of different external parameter combinations, the characteristic of the external parameters is stored in addition to their characterisation by name. Over and above the normal

10 classification, the paper is characterised by, for example, opacity, roughness, absorption behaviour, thickness, grammage, filler content. In addition to the normal classification such as Euroskala Heatset, the ink is characterised by colour spectrum, colour

15 location, viscosity, stickiness, damping solution absorption behaviour. These parameters, or a selection thereof, are stored with the profile, in order thus to obtain a complete description of the printing machine in the profiling state.

20   If, for example, it is known how the tone value increase behaves for different paper roughnesses but otherwise the same conditions, various, though not too different, types of paper can be handled with one profile by deriving the profile to be used from this

25 one by way of the known dependencies.

        According to the prior art, this is done by using the same profile for similar types of paper and compensating for the remaining deviation by means of the final control elements of the machine. The

30 invention avoids this need for correction.

        Based on the profile pool 6, a print job is now handled as follows: the digital data 2 of a print job are sent to the data-processing device 3 that is to prepare the data for the printing machine 1. In

35 general, this data-processing device is the RIP (Raster Image Processor) which converts the data 2, which until

then are not prepared in a machine-specific manner, for the production of images on the printing forme. In offset printing, this is binary data, which describes the occupied and unoccupied areas (pixels) of the printing forme.

Before the RIP process begins, the RIP 3 retrieves the machine parameters which are to prevail at the instant of the printing process, i.e. there is a communication between the RIP 3 and the printing machine 1. These machine parameters can be derived for example from the current parameters.

In practice, the machine status is permanently monitored by means of suitable measuring sensor technology. Such sensor technology (densitometer, colorimetry device online and offline) is commercially available. The trend is determined over the printing time. If, for example, the temperature increases slowly, the viscosity of the printing ink slowly becomes lower and the tone value increase changes accordingly. This change can be ascertained together with the speed of change by statistical methods. If the RIP now extracts the next profile, there is carried out by way of the known print volume of the current job, by way of the status of the job (to what extent has the job already been processed) and by way of the printing speed of the machine, an estimate of the start of the print job about which the inquiry is made. With the measured machine status and the trend analysis, it is then possible to extrapolate to the state of the machine at the instant of the print job about which the inquiry is made.

A possibility for the manner in which the machine parameters for a print job are ascertained is explained in greater detail below.

It is assumed that the current machine parameters are known. They can be kept constant by way of

machine-structure or control-engineering methods or ascertained online or offline.

For the job currently being printed a profile 20 was selected which takes on a set of machine parameters, namely the one which was current at the instant of the profile creation and which is stored with the ink profile.

Ideally, the parameters agree with the set of parameters of the desired state of the machine. If no further influencing factors are known, it can then be assumed that this desired machine state also applies for the subsequent print job and the profile for the external set of parameters of the print job can be applied directly.

If there is a deviation from the desired state, the profile has to be adapted, as shown at 30, for the print job to be prepared. The possibility which is preferred here uses a combination of the (four-dimensional) ink profile and one-dimensional correction curves 10 (Figure 3).

The use of an ink profile 20 for the conversion from the working colour space of the pre-press stage into the target colour space of the printing machine is always a multi-dimensional transformation, usually from RGB to CMYK, a transformation from a three-dimensional space to a four-dimensional space, from a standard colour space such as Lab to CMYK, from a three-dimensional space to a four-dimensional space, or in the case of a CMYK to CMYK conversion, from one four-dimensional space into another. This conversion is often, as is possible in the case of ICC profiles, for example, followed by a one-dimensional transformation of the individual colour area coverages.

The adaptation of the multi-dimensional transformation of a profile of this type to current machine parameters is complex. It is simpler to leave

the multi-dimensional transformation unaltered and, in
a second step, to carry out the deviations of the
current machine profile to the ink profile, but only
one-dimensionally for the respective colour or print
position.

In order to do this, for each colour, the
individual colour characteristic taken up in the
profile is compared, as at 30, with the current
characteristic and a one-dimensional correction
characteristic is formed, which corrects the image data
according to the multi-dimensional colour space
transformation in such a way that the difference
between assumed and current characteristic for each
tone value is compensated, as indicated at 31. This
correction characteristic can be included with the one-
dimensional individual colour characteristics, in order
to avoid performing the transformation twice (Figure
3).

The altered one-dimensional transformations can
then be stored in an altered profile, so that an
adapted profile results. Preferably, however, this
adaptation is carried out only for the respective print
job, and the number of profiles to be managed can thus
be kept low.

In a first approximation, the correction
characteristic is determined from the deviation of the
current machine status with respect to the desired
machine status during the job being printed and is then
used for the compensation of the next job, even if the
latter has different printing characteristics, for
example because of the use of a different paper.

If the ink profile used allows only a multi-
dimensional transformation, one-dimensional
transformations for each colour then have to follow,
which transformations are given directly by the
correction characteristic.

The RIP process then obtains from its inquiry the ink profile 20 to be used, selected from the profile pool 6, and the linear correction characteristics 10 to be used, or the already correspondingly adapted

5 profile. It carries out the transformation and data preparation and passes the data on to the image-producing system.

In this way, the image data for the current machine state and the external parameter combination to

10 be printed are adapted optimally and render possible an exact print which agrees to the maximum extent with the target specifications.

An advantageous development of the invention lies in the introduction of threshold values for checking

15 the quality of the profile which is used. The set of parameters of the profile which has been selected can deviate from the current set of parameters and will also do so in the normal case. It is now possible to introduce threshold values for the deviations, below

20 which the quality to be achieved during the use of the profile is achieved without restriction.

Examples are a deviation of the predicted tone value curve from the actual curve by less than 2% for quality demands which are not too high, the use of

25 paper with a slightly altered absorption behaviour, the use of paper with a slightly altered colour location.

The threshold values can be quality-dependent and job-dependent, i.e. they are lower for very high quality demands than for only moderate quality demands,

30 they are lower for critical subjects than for uncritical subjects. Critical is here to be understood in the sense of being difficult to reproduce by the machine, something which can be assessed in a relatively problem-free manner by a person skilled in

35 the art.

If the deviation reaches the threshold value, on

the one hand a linear compensation (as in accordance with Figure 3) can be used, and on the other hand a profile interpolation can be used in order to generate a profile adapted to the machine condition (as in accordance with Figure 2). This profile can, as described above, be adapted only in a linear manner or have undergone a true multi-dimensional adaptation.

At the instant of the data preparation for the image production, the machine status predicted for the instant of printing is extracted at 8; from this, together with the knowledge about the working materials 7, the machine profile which comes closest to the profile corresponding to the print job is selected from a pool 6 of stored profiles, and a profile 15 is interpolated or derived therefrom and used for the data preparation 3.

If an interpolation with sufficient quality is not possible, or if the deviations are greater than a further threshold value, the operator is warned. The available alternatives for action are displayed to him - use the closest profiles anyway, use other working materials, change machine conditions, re-profile - and a decision is requested.

An analogous manner of proceeding, but without the possibility of adapting the data, applies for a check of the machine conditions at the instant of printing. If deviations from the actual data preparation that are greater than predetermined threshold values are ascertained here, the operator is displayed a colour alarm. The thresholds can again be quality-dependent and job-dependent. Again, the operator is shown alternatives - use other working materials, change machine conditions, produce images again using another profile, create a new profile - and a decision is requested.

A further preferred embodiment (in accordance with

Figure 4) of the invention aims at a modularisation of the digital printing machine 1. The RIP 3 is today the limit of the pre-press stage production flow. In a digital printing machine 1, the control of the machine
5   itself also has its own data-processing possibilities. In a modern production flow, so-called job tickets 50, 51 are now used, which contain items of meta information (information about image data, further processing information, job management information, job
10   name, job information, etc) about a print job and thus, for example, can influence the manner of the RIP process, the raster parameters and suchlike. In the context of the use of job tickets 50, 51, the communication between the RIP 3 and the printing-
15   machine control can also take place as a result of the fact that the printing machine alters the job ticket of a job and the RIP 3 then requests a job ticket 51 and receives it from the printing-machine control. All necessary information for the RIP process, including
20   the one-dimensional and multi-dimensional ink profiles, are then contained in the job ticket and are applied to the job described by the job ticket. A communication in the opposite direction, i.e. from the RIP 3 to the printing machine 1 by way of a job ticket 50, is also
25   possible.

In order to obtain a profile pool 60 that is as large as possible (in accordance with Figure 5), it is possible to exploit the fact that a digital machine 1 is connected directly to the data network. As a result
30   of this, the profile pool 60 can be made commonly accessible to a plurality of digital printing machines 1 of this type.

If, for example, a central data pool 60 is created, then by way of gateways or routers each
35   machine 1 can, for example over the Internet, have worldwide access to this data pool and retrieve and

store profiles there. By way of the information about the machine profile and the working materials, the profiles are comparable and, at least in the case of sufficient similarity, can be used or converted.

The similarity of two profiles can, for example, be determined in the following way:

Each profile is characterised by a number of external and internal parameters. Each of these parameters is now weighted with the significance of its influence on the profile. This weighting can also be adaptable to different printing conditions, such as use for packaging or use for gravure printing or use for newspaper production.

A cumulative value is now formed from the amounts of the differences between the values of the individual parameters in the profile A and the values of the parameters in profile B, multiplied by the weighting of the respective parameter. The resulting sum, which is always positive, is smaller the more similar the sets of parameters of the profiles are, and zero in the case of printing conditions which are exactly the same. The determining of the similarity can also take place via fuzzy logic or neural networks, or a combination of the two. With a method of this type, parameters which are difficult to put in exact numbers can also be linked in.

Claims

1. A method for calibrating by means of colour management a digitally controllable printing machine having a permanent printing forme, for which printing machine image data are prepared for the printing process in a pre-press stage (70) in machine-independent format (2) by means of a data-processing device (3) and are supplied in adapted form to an image-producing unit of the printing machine (1), characterised in that at the instant of the data preparation (3) for the image production (4), a machine state predicted for the instant of printing is extracted (8); from this, together with knowledge about the working materials (7), is determined the machine profile (5, 15, 20) that comes closest to the profile for the print job, and this profile (5, 15, 20) is used for the data preparation in the data-processing device (3).

2. A method according to claim 1, in which at the instant of the data preparation (3) for the image production (4), a machine state predicted for the instant of printing is extracted (8), from this, together with the knowledge about the working materials (7), is selected from a pool (6) of stored profiles the machine profile (15) that comes closest to the print job, and the profile (15) is interpolated and used in this way for the data preparation in the data-processing device (3).

3. A method according to claim 1, in which at the instant of the data preparation (3) for the image production (4), a machine state predicted for the instant of printing is extracted (8), from this, together with the knowledge about the working materials (7), is determined from a pool (6) of stored profiles the machine profile (20) that comes closest to the profile for the print job, this profile is used for the

data preparation (3) and the remaining deviations are corrected (31) in a second step (30) by way of one-dimensional correction tables for each colour separation.

4. A method according to claim 3, in which the machine profile (20) basically contains an ink profile together with the characteristics of the individual colours.

5. A method according to any preceding claim, in which the machine profile (5, 15, 20) basically contains an ink profile together with the generic characteristic values of the printing machine (1), such as individual printing unit characteristics, colour sequence, ink acceptance behaviour.

6. A method according to claim 1, in which the ink profile (5, 15, 20) is an ICC profile.

7. A method according to claim 3, in which the one-dimensional correction (31) corrects the tone value increment from that taken into account in the profile (20) to the predicted tone value increment of the target printing unit (1).

8. A method according to claim 3, in which the one-dimensional correction (31) corrects the density characteristic from that taken into account in the profile (20) to the predicted density characteristic of the target printing unit (1).

9. A method according to any preceding claim, in which an alarm is triggered and the operator asked for instructions if a suitable profile could not be found.

10. A method according to any preceding claim, in which an alarm is triggered if a profile having the correct combination of working media to be used is not found.

11. A method according to claim 9, in which an alarm is triggered if the difference between the profiles which have been found and the actual machine

state exceeds a predetermined threshold value.

12. A method according to any preceding claim, in which the predicted machine profile is the current profile.

13. A method according to any preceding claim, in which the predicted machine profile is extrapolated from the current profile by way of an expert system.

14. A method according to claim 12 and 13, in which the current machine profile is calculated from data originating from sensors inside the machine, together with knowledge about the machine characteristic.

15. A method according to any preceding claim, in which images are produced on the printing forme inside the printing machine (1).

16. A method according to any preceding claim, in which images are produced on the printing forme outside the printing machine (1), but there is a direct data connection between the production of images on the printing forme and the printing machine (1).

17. A method according to any preceding claim, in which profiles are stored in a data pool (6, 60) which can be accessed by a plurality of digital printing machines (1) and from which profiles (5, 15, 20) are retrieved if no suitable ones are available locally and in which newly created profiles are additionally stored in order to obtain a profile pool that is as large as possible.

18. A method according to claim 17, in which the data pool (60) is addressed by way of the Internet.

19. A method according to any preceding claim, in which, directly before printing, the current machine state is checked and if the state is further than a specifiable threshold from the state adopted in the image production, the operator is warned.

20. A method according to claim 19, in which the

threshold depends on the specified quality or type of the print job.

21. A method according to any preceding claim, in which the communication between RIP (3) and printing machine (1) takes place by way of a job ticket (50, 51).

22. A method according to any preceding claim, in which a job-ticket structure contains the machine profile data, ink profiles and profiles of external parameters.

23. A method according to any preceding claim, in which the similarity of two profiles is determined by weighting each parameter of a profile with the significance of its influence, and a cumulative value is formed from the differences between the values of the corresponding parameters of the first and second profiles, this cumulative value being multiplied by the weighting of the respective parameter.

24. A method substantially as described with reference to any of the embodiments shown in the accompanying drawings.

25. A colour management system for carrying out a method according to any preceding claim, comprising a data processing device (3), a memory (6) for storing ink profiles corresponding to various machine states, and a means for determining the closest profile for the current print job and selecting this profile for use by the data processing device.

Application No: GB 9922962.7	**Examiner:** Dave McMunn
Claims searched: 1-24	**Date of search:** 28 March 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4F (FGB, FGC).

Int Cl (Ed.7): H04N 1/60.

Other: ONLINE : WPI, EPODOC, JAPIO.

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	GB 2,275,584 A	(QUANTEL). See LUP 15 & Interpolator 16	2
X	EP 0,881,826 A2	(CANON). See e.g. line 51, column 9 to line 7, column 10 & Fig 2	1
X,Y	WO 96/08916 A1	(APPLE). See e.g. lines 14 to 27, page 7	X:1 Y:2
Y	WO 94/08274 A1	(E.I. DU PONT). See LUP 12 & Interpolator 14	2
A	US 5,313,291	(XEROX). See Figs 1 & 2	1
X	JP 7203131 (See US equiv'nt 5,859,933 - e.g. -	(CANON) lines 49 to 58, column 15)	1

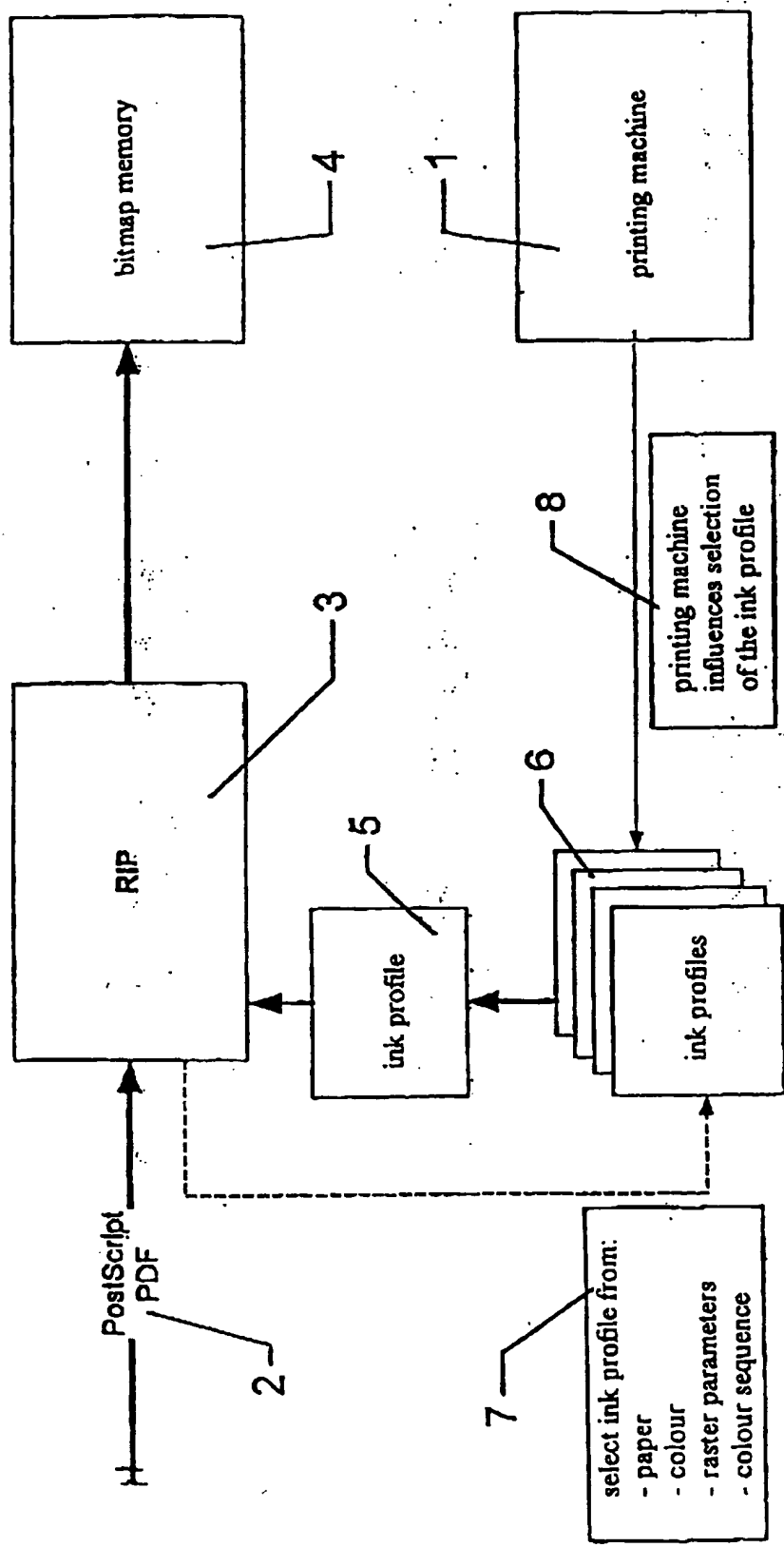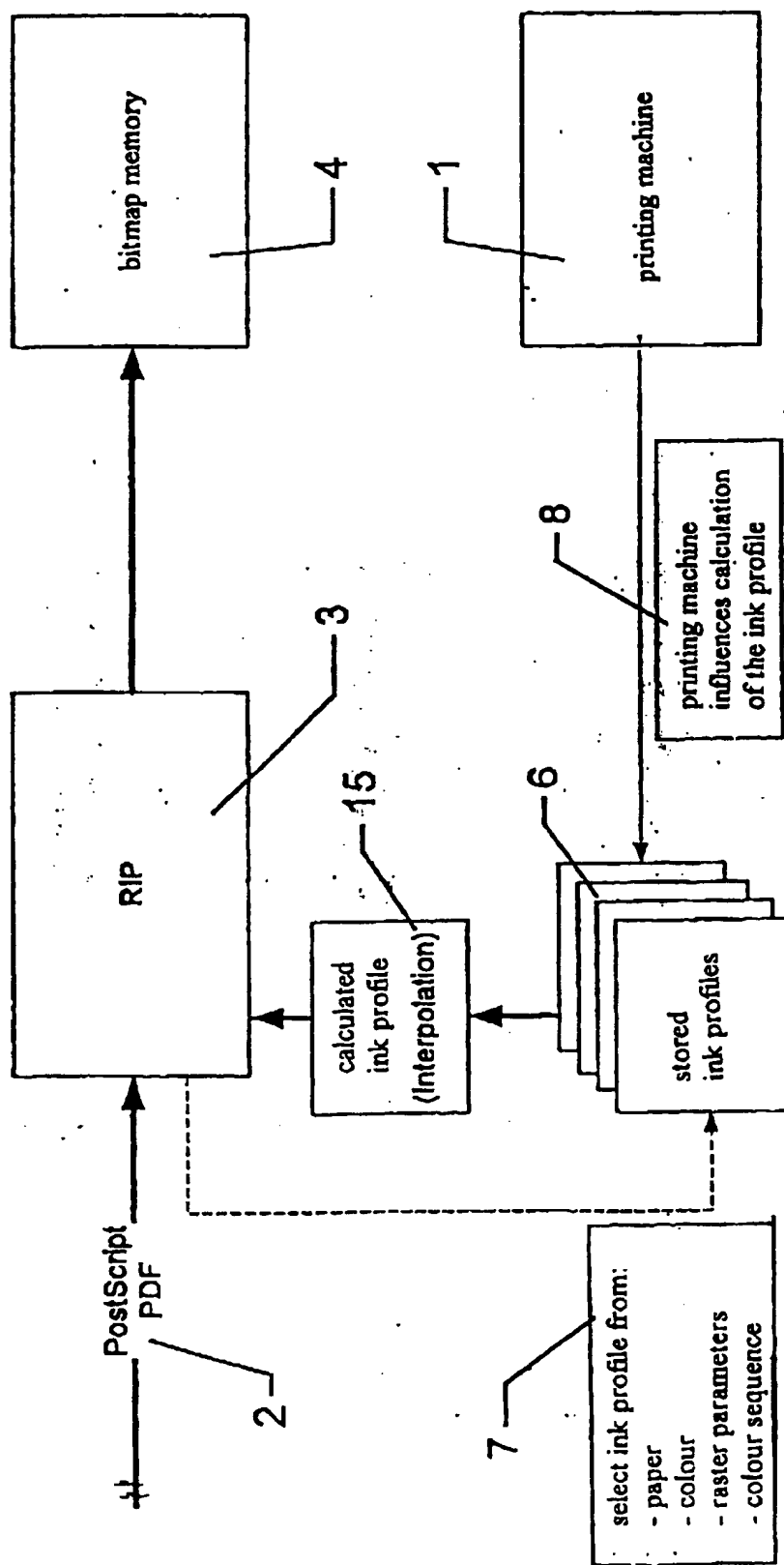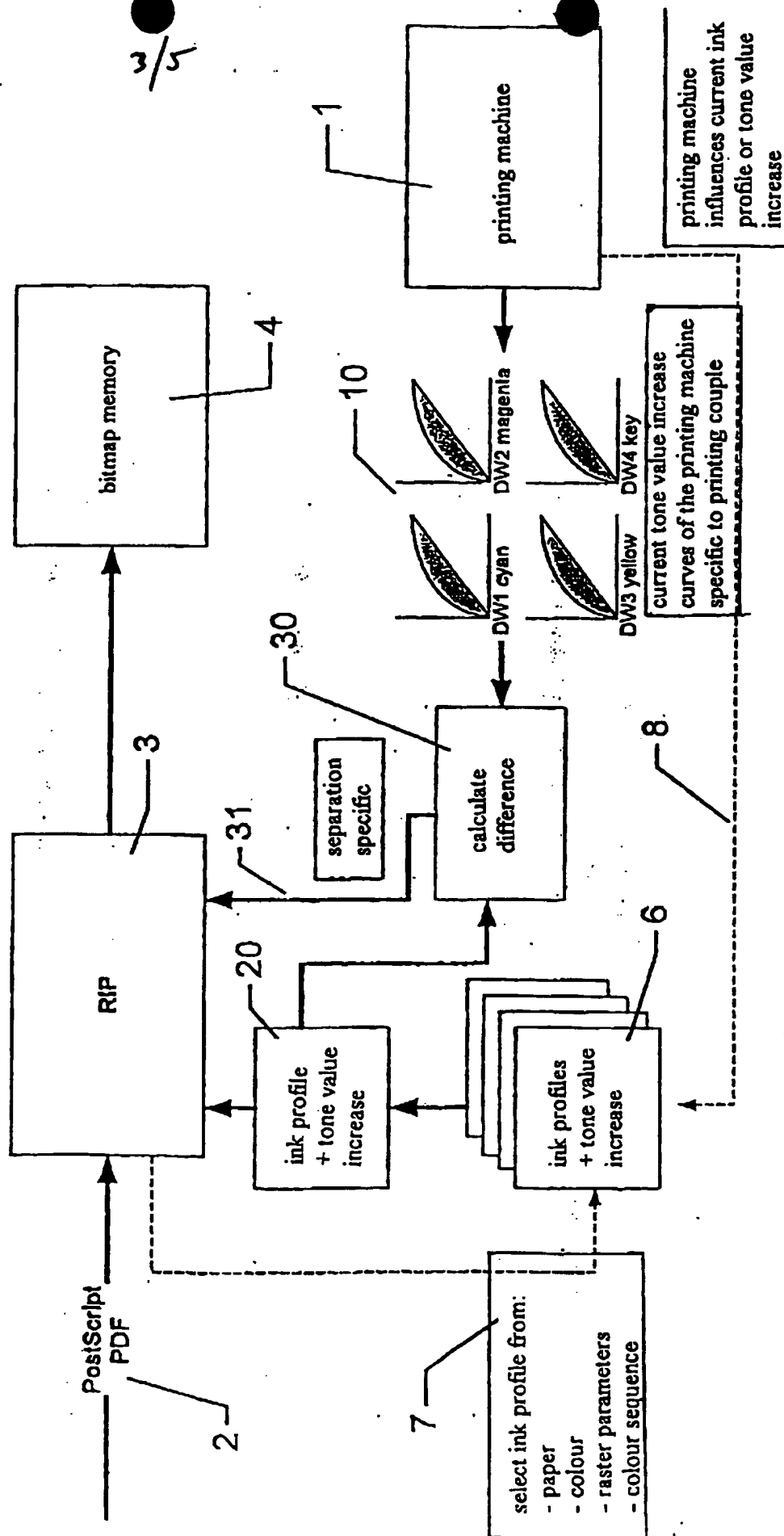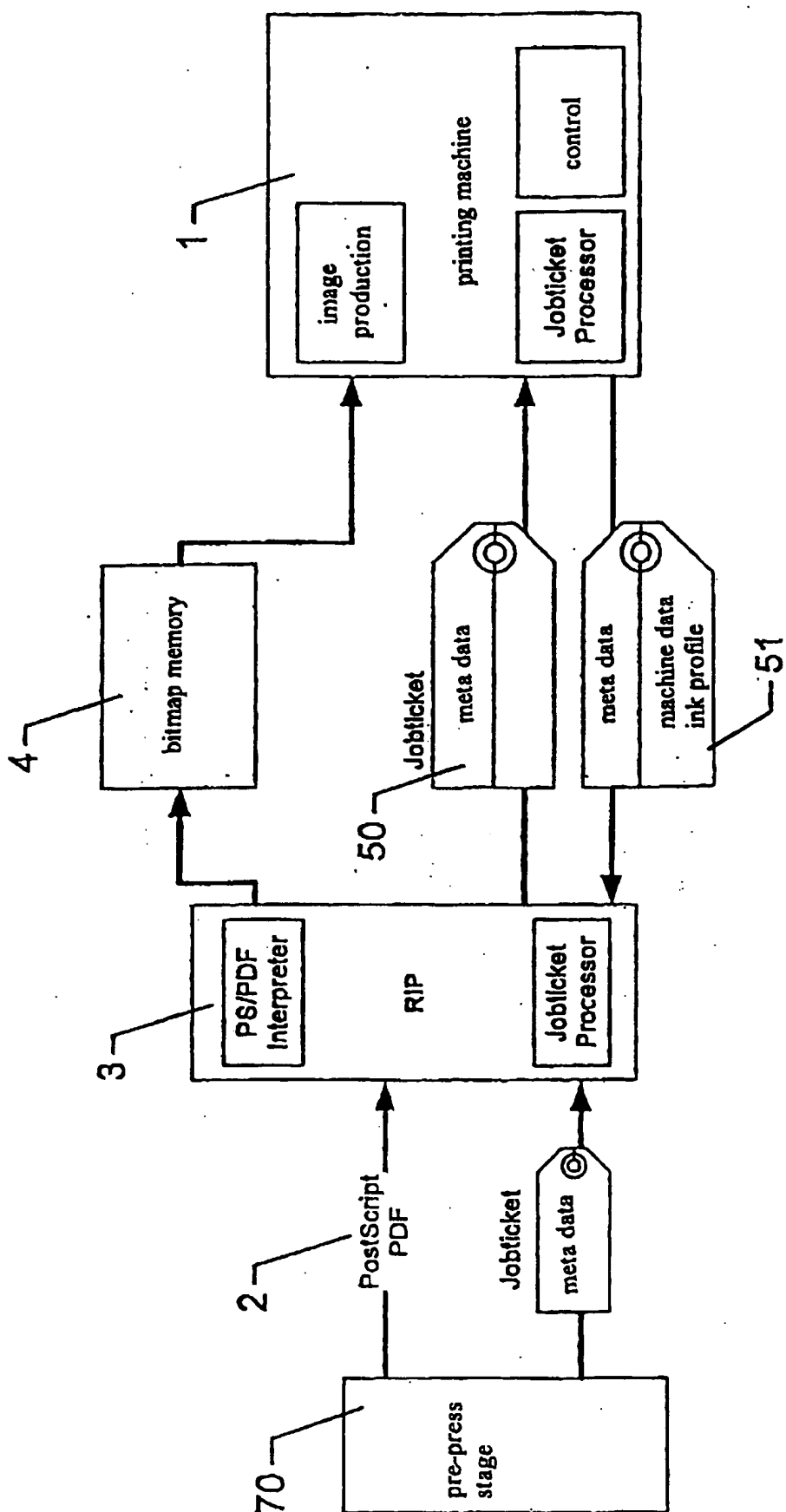| X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Fig. 1

bitmap memory — 4

RIP — 3

PostScript PDF — 2

ink profile — 5

ink profiles — 6

printing machine — 1

printing machine influences selection of the ink profile — 8

select ink profile from:
- paper
- colour
- raster parameters
- colour sequence

— 7

Fig. 2

bitmap memory — 4

printing machine — 1

RIP — 3

PostScript PDF — 2

calculated ink profile (Interpolation) — 15

stored ink profiles — 6

printing machine influences calculation of the ink profile — 8

select ink profile from:
- paper
- colour
- raster parameters
- colour sequence

— 7

Fig. 3

Fig. 4

Fig. 5

profile storage
statistical evaluation
and profile generation

profiles

printing machine

1

60

profile
data pool

profiles

printing machine

1

RDT

[remote data transmission]

profiles

printing machine

1